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The plant life of Hartsville, South Carolina.—A delightful account of the flora of his old home town has been given us by COKER.[36] After a brief consideration of the climate, topography, and geology, the various plant formations are considered in turn as follows: sand hills, upland forests, flatwoods, savannas, bays and swamps, lakes and ponds. In the sand hills *Pinus palustris* still dominates; elsewhere its place has been taken largely by *Pinus Taeda*. The resistance of the former to fire is strikingly brought out. *Quercus Catesbaei* is one of the chief forms in the undergrowth. In the upland forests *Quercus falcata* and *Q. velutina* are dominant, although *Pinus palustris* once held an equal place with them. The flatwoods are poorly drained and also are dominated by pines and oaks. The savannas are essentially confined to undrained depressions in the flatwoods. The term bay, a folk-name of the coastal plain, is applied to shallow swamps and is contrasted with the deep swamps. More than half of the work is made up of an annotated list of the Hartsville plants, the trees being annotated more fully than the rest. The chatty, personal touch of this treatise recalls the charming volumes of the older naturalists, who followed in the train of GILBERT WHITE.—H. C. COWLES.

Evolutionary observations from New Zealand.—During the many years which COCKAYNE has devoted to ecological studies in New Zealand, he has, of course, observed many phenomena interesting from the point of view of evolution. These observations are now gathered together into compact form.[37] It is freely admitted that only through careful experiment can exact results be reached, though it is asserted that much valuable experimental material can best be disclosed by ecological study. COCKAYNE cites probable examples of elementary species, variation, and mutation. Epharmony is considered in detail, since it is felt that here is where ecology presents its most important contribution; convergent epharmony, as illustrated by divaricate shrubs, cushion plants, etc., in different families, is especially in evidence in New Zealand. Persistent juvenile forms have often been noted by COCKAYNE, and they are here set forth in some detail. In discussing the struggle for existence, it is noted that the 550 introduced species of New Zealand are by no means submerging the native flora, except in grazed or burned areas. The virgin timber is wholly free from these introduced elements.—H. C. COWLES.

Root characters, ground water, and plant distribution.—CANNON[38] has done much to orient our minds properly with relation to the characters and significance of roots. His discovery of the superficial root systems of cacti has altered our notions concerning the prevailing deep-rootedness of desert plants. In a recent short paper he brings further data along similar lines. The mesquite, as is well known, either may be a shrub or it may be a tree of considerable size. On flood plains, where it is a tree, its roots penetrate to the water table, whose depth may be 15–25 feet. Shrubby specimens on higher grounds have extensively spreading rather than deep roots. CANNON considers the root situation in different types of climate and makes several interesting suggestions.

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[36] COKER, W. C., The plant life of Hartsville, S.C. pp. 129. *pls. 15.* Published by the Pee Dee Historical Association. Columbia, S.C. 1912.

[37] COCKAYNE, L., Observations concerning evolution, derived from ecological studies in New Zealand. Trans. N.Z. Institute **44**:1–50. *pls. 8. figs. 3.* 1912.

[38] CANNON, W. A., Some relations between root characters, ground water, and species distribution. Science N.S. **37**:420–423. 1913.

In a brief note[39] CANNON calls attention to the somewhat curious fact that at Carmel, California, the removal of the chaparral undergrowth in forests of *Pinus radiata* is followed by the death of the pines. This is attributed to the shallow root system of the pines, which comes to grief when the soil is desiccated as a result of the removal of the chaparral.—H. C. COWLES.

Sand hill forestation.—Some government experiments of considerable interest to ecologists are being conducted in the sand hills of Kansas and Nebraska, as noted by BATES and PIERCE.[40] While the sand hills of Kansas are not extensive, almost a fourth of Nebraska is thus classified. Trees and even shrubs are not naturally very abundant in the sand hill region except along streams. In the planting a cue is taken from nature in the presence of *Pinus ponderosa* in the sand hill region; the occurrence of isolated tracts of this species suggests a former more extensive distribution. At the suggestion of Professor BESSEY, the Forest Service began planting as far back as 1891. About ten years ago, large tracts of land capable of forestation were set aside as national forests, and nurseries were established at Halsey, Nebraska, and Garden City, Kansas. In the Nebraska nursery, attention has been paid to conifers, and success has been had especially with *Pinus Banksiana* and the native *P. ponderosa*. In the Kansas nursery, experiment has been made chiefly with hardwoods.—H. C. COWLES.

The chemistry of symbiosis.—Not much is known concerning the exact chemical interrelations of symbionts. To ZELLNER it is a matter of surprise that investigators of symbiosis have paid so little attention to this fundamentally important feature, and he indicates in a brief paper[41] some of the places where more knowledge is urgently needed. Best known, of course, are the chemical interrelations existing between bacteria and Leguminosae. The significance of mycorhiza is much in dispute; ZELLNER'S view is that the fungi are water-absorbing organs for the roots. In the endotrophic forms phago-

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[39] CANNON, W. A., A note on a chaparral-forest relation at Carmel, California. Plant World **16**:36–38. 1913.

[40] BATES, C. G., and PIERCE, R. G., Forestation of the sand hills of Nebraska and Kansas. Bull. 121, U.S. Forest Service. pp. 49. *pls. 13. fig. 1.* 1913.

[41] ZELLNER, JULIUS, Die Symbiose der Pflanzen als chemisches Problem. Beih. Bot. Centralbl. **28**^{1}: 473–486. 1912.